Form (see Figure 4-4) will be completed for each monitoring well and includes:

- project name, well identification, and date;
- date, time, ground water elevation and bottom of well elevation before development;
- development method;
- time spent developing;
- volume of water removed and significant changes in color, clarity, etc.;
- volume and source of any water added to the well;
- total depth of well and static water level immediately after and 24 hours after development;
- temperature, pH, specific conductance, and turbidity readings taken before, during, and after development;
- name and title of person(s) developing the well; and
- name and/or description of the disposal facility for waters removed during development.

Handling and disposition of investigation derived waste is discussed in Section 4.19.

4.10 BOREHOLE GEOPHYSICS AND DOWNHOLE VIDEO SURVEY

4.10.1 Locations

Borehole geophysical surveys will be conducted in the following well borings prior to well installation:

- Seven intermediate wells installed at the North Base Landfill,
- Six intermediate and six deep HIA capture zone monitoring wells, and
- The three HIA production wells which are selected for depth specific sampling (Section 3.7). Those wells will include HIA-13, one of the five eastern HIA wells, and one of the nine western HIA wells.

Figure 4-4
Well Development Form
Middletown Airfield Site

Project:	Site Name:	Location:
Date:	Form Completed by:	Job Title:
Total Depth of Well:	Elevation of Base of Well:	
Initial Water Level (Static) Water Level Immediately Following Development Water Level Afer Development (Static)	Date Measured: Date Measured: Date Measured:	Time: Time: Time:

Method of Development: Type Size Make

Bailer
Pump

Total Development Time:	Total Volume of Water Removed:	Average Pumping Rate:

	Before Pumping	During Pumping	After Pumping
Date and Time			
Volume of Water Removed			
Description of Water (Clarity, Particulates, Odor)			
pH			
Conductivity			
Turbidity			
Temperature			
Characteristeics of Sediment, Color, Odor, etc.			

Volume of Sediment from Last One Liter of Development Water:

Description of Containers and Containing Area for Water Removed During Pumping:	Container Size:	# of Containers:
Volume of Any Added Water:	Source of Any Added Water:	For Added Water: Temp pH Conductivity Turbidity

Borehole video camera surveys will be conducted in the following borings:

- six intermediate and six deep HIA capture zone monitoring wells;
- the three deep wells installed for deep ground water flow determination; and
- the three HIA production wells described above.

The downhole video surveys of the HIA capture zone monitoring wells and the deep flow monitoring wells will be performed to select appropriate zones for packer testing.

4.10.2 *Techniques*

ERM's subcontractor, *welenco, inc.*, will perform the geophysical logging and downhole video surveys. The following borehole geophysical logging techniques will be used in the monitoring well borings: temperature, fluid resistivity, natural gamma ray/neutron, density, and electric (resistivity and spontaneous potential (SP)). The boreholes will also be logged with a three-arm caliper which measures borehole diameter.

All downhole tools and cables will be decontaminated between boreholes. Standard logging tool calibration checks will be performed and documented. Five copies of each merged well log, original copies of each log, and documentation of all logging tool calibrations will be presented, on a scale of 5 inches per 100 feet, to the USACE. Digital logs on diskettes in DOS ASCII format will also be provided to the USACE.

The borehole video survey will be conducted before the geophysical logging in those holes where it is required in order to minimize disturbance of the water column which may affect quality of the picture. The video survey will be monitored on a real-time basis as the camera is lowered down the borehole and simultaneously recorded on a VHS format video tape. Special attention will be given to identification of potential water-producing zones indicated by the presence of lithologic changes, fractures (open and sealed), and secondary solution features. A footage meter will record depth from the starting point and continually project the depth on the video screen. A copy of the video tape, labeled with location, well number, total depth, and date of survey, will be provided to the USACE.

4.11 *GROUND WATER SAMPLING*

4.11.1 *Locations*

Ground water sampling and analysis will be conducted at all of the new monitoring wells, 48 existing on-site monitoring wells, 14 production wells including the 13 HIA wells and MID-04, and up to eight residential wells. Specialized ground water sampling of specific depth intervals will also be conducted at three HIA wells.

4.11.2 *Techniques*

A complete round of water level measurements and non-aqueous phase liquid (NAPL) thicknesses for all new and existing wells will be conducted prior to the ground water sampling event. The water level, NAPL thickness, time of measurement, well depth, weather conditions at the time of measurement, and date will be recorded. Measurements from all wells will be completed within the smallest time frame possible to reduce external variables. A maximum 24-hour interval will be allowed for completion of the water level measurements.

4.11.2.1 *Monitoring Well Sampling*

All newly installed monitoring wells will be developed according to the procedures described in Section 4.9.4 and allowed to stabilize for a minimum of two weeks prior to ground water sampling. Five new shallow monitoring wells in the Industrial Area (two in the pipeline area and three in the main building areas) will be sampled two weeks after development, and the samples will be analyzed by the off-site laboratory for TCL VOCs plus TICs with 14 day turnaround to provide data to determine the appropriate locations for the proposed intermediate and deep monitoring wells. All monitoring wells will be sampled during a single comprehensive ground water sampling event, and the ground water samples will be analyzed for the parameters listed in Section 3.13.

The monitoring wells will be purged and sampled proceeding from the suspected least to most contaminated wells to minimize potential cross-contamination. The sampling order will be determined based on approximate ground water flow directions, results of the field screening, well locations with respect to the suspected source areas, historical ground water data, and field headspace readings measured during drilling.

Depth to water and total depth of each well will be measured with an electronic water level probe prior to purging. The presence of NAPL at the top and bottom of the water column will also be determined prior to purging using an oil-water interface probe. If NAPL is encountered, a sample will be collected according to the procedure described in Section 4.11.2.4..

The monitoring wells will be purged prior to sampling using an appropriate method for the diameter, depth, and estimated yield of each well. Each well will be evacuated until a minimum of three volumes of water standing in the well casing are removed. The purge volume for each well will be calculated based on the depth to water and total depth measurements, according to the following equation:

$$3 \times (\pi \times r^2 \times h \times 7.48 \text{ gallons/ft}^3)$$

where: $\pi = 3.14$,

r = radius of well casing (in feet), and

h = height of the water column (in linear feet).

A submersible pump will be used for well evacuation. Proper pump placement will ensure complete and proper evacuation. The depth of pump placement will depend on the well yields. Small diameter pumps typically have low flow rates ($\leq$1.5 gpm), necessitating initial placement of the pump intake at the top of the water column in high yielding wells. The pump is lowered further into the well as purging proceeds to ensure that all of the stagnant water in the well is removed. Pump placement will be near the bottom of the well for low yielding wells. Pumps will be placed into and removed from the wells slowly and gently to minimize turbidity levels. Upon removal of the required purge volume, the pump system will be removed from the well. Wells that are inaccessible with the pump system, or wells that have very low yields, will be hand bailed using dedicated PVC or decontaminated stainless steel bottom-loading bailers.

The temperature, pH, specific conductance, and turbidity of the purge water will be measured and recorded during the purging process. Field parameters will be measured at the start of purging and twice per casing volume removed. The well will be purged beyond three casing volumes until the field parameters have stabilized (0.2 pH units or a 10 percent change for the other parameters between four consecutive readings). The total purge volume will be measured and recorded for each well. Slow recharging wells for which three casing volumes cannot be removed will be pumped or bailed dry and sampled as soon as sufficient recharge has occurred.

Submersible pumps will be decontaminated between each use. The pump will be placed in a container of clean tap water, and 4 to 5 gallons of approved water will be run through the pump. The procedure will then be repeated using a container filled with distilled water. Purge and pump decontamination water will be contained in steel 55-gallon drums labeled with the well number and sampling date or in polyethylene holding tanks and stored on-site pending analytical results. The purge water will be handled according to the provisions in Section 4.19.

Ground water samples will be collected using dedicated PVC or decontaminated stainless steel bailers. Polypropylene monofilament line will be used to raise and lower the bailers. Samples will be collected within two hours of well evacuation when at all possible. If well yields are low, the samples will be collected as the well recovers and provides a sufficient volume of water for sample collection. Extremely low yielding wells will be given the entire day to recover. If necessary, samples will be collected the following day.

Ground water samples will be placed in laboratory-supplied sample containers with the proper preservatives already added in accordance with the specific analyses required. Samples will be collected in a manner which minimizes agitation of the water column and reduces the possibility of loss of volatile constituents during transfer of the sample to the sample containers. Samples for VOC analysis will be collected first at each monitoring well location. The sample containers will be filled slowly and completely so that no air bubbles become trapped inside the container. Ground water samples that are collected for dissolved metals analysis will be field filtered prior to preservation according to the procedures described in Section 4.18.

Field parameters, including temperature, specific conductance, turbidity and pH, will be measured and recorded for each ground water sample at the time of sample collection. A sample will be poured into a beaker or other appropriate container to obtain these measurements. All measurement probes will be rinsed with distilled water between samples. The meters used for measuring field parameters will be field calibrated daily according to the procedures described in the QAPP.

4.11.2.2 *Production and Residential Well Sampling*

ERM will coordinate with HIA, the Middletown Water Department, and local residents to schedule the sampling of the production and residential wells. ERM will obtain information about the wells, including location, condition, depth, whether or not the well is in use, estimated yield, type of pump, and well logs, if available. ERM will locate and inspect the residential wells prior to sampling, and if possible, depth to water and total depth will be measured.

The production wells will be purged and sampled from the sample tap. Residential wells will be purged and sampled from a tap in the house. Treatment systems will be removed or turned off prior to purging, and the system will be purged for a minimum of 15 minutes. The sample will be collected directly from the tap. A steady, low volume water flow will be maintained during sample collection to minimize aeration of the sample.

4.11.2.3 *Depth Specific Sampling of the HIA Production Wells*

Depth specific sampling will be conducted at three HIA production wells to determine the depths at which contaminants are entering the wells. The wells which will be sampled will include HIA-13, one of the eastern HIA wells (HIA-1 through HIA-5), and one of the western HIA wells (HIA-6 through HIA-14). The specific eastern and western wells will be selected after additional information about the wells has been obtained from the HIA.

The logging and sampling procedures will be conducted at each well in the order described below.

1. The existing pump, if present, will be removed from the well and stored for the duration of the testing.

2. A downhole video survey will be conducted to obtain a video inspection of the casing and the open borehole.

3. ERM's subcontractor, *welenco, inc.*, will perform the following borehole logging procedures while the well is at static conditions, in the order indicated: temperature and fluid resistivity (a combined tool), caliper, spinner flowmeter, and natural gamma ray/neutron log (a combined tool). The logging sequence will vary slightly from the order requested by USACE because the temperature and fluid

resistivity logs are obtained simultaneously from the same tool; therefore, the caliper log will be run after the fluid resistivity log.

4. Ground water samples will be collected from five depth intervals in each well during static conditions. The sample intervals will be selected based on the geophysical logging results. Samples will be collected from five intervals throughout the full well depth which are interpreted from the logs to represent significant water bearing zones. A specialized sampling device will be lowered to the required sample depth. The sampler is constructed of stainless steel and comes in two sizes: 2.125-inch and 3.0 inch outside diameter, with volumes of 1 liter and 2 liters, respectively. The size used will depend on the diameter of the access pipe (for samples collected during flowing conditions) and the volume of sample required. The ground water sample will be drawn by opening and closing a motor-operated valve. The sampler will be brought back to the surface to fill the sample bottles. It will be necessary to repeat this procedure several times for each interval to obtain the necessary sample volumes for the required analytical parameters because the maximum sampler capacity is 2 liters. The containers for the TCL VOCs will be filled first at each location. The sampler will be disassembled and decontaminated between sample intervals according to the procedure described in Section 4.17.2. This sampling procedure will be repeated until each of the five intervals has been sampled.

5. A test pump and access pipe (for the logging and sampling tools) will be installed in the well. The pump and access pipe will be set as high in the well as possible to minimize interference with subsequent logging of the well under flowing conditions. Pumping will begin, and the well rate will be allowed to stabilize prior to logging. Pumping will continue until logging and depth specific sampling are completed.

6. The following logging procedures will be conducted, in the order indicated, while the test pump is operating: spinner flowmeter, temperature and fluid resistivity. Natural gamma ray logging will not be repeated during pumping because the gamma ray signature of the formation will not be affected by pumping of the well.

7. Ground water samples will be collected from five depth intervals in each well during flowing conditions. The sample intervals will be selected based on the geophysical logging results. The samples will be collected from five intervals across the full depth of the well that are interpreted, based on the logs, to represent significant water

bearing zones. The same procedure will be followed for collecting depth specific ground water samples while the pump is operating as was followed during static conditions.

8. The test equipment will be pulled from the well. The original pump will be replaced in the well and returned to pre-test operating conditions, if applicable.

The logging and depth specific sampling procedures will be repeated at each of the three HIA wells.

4.11.2.4 NAPL Sampling

If NAPL is detected in a well, a sample will be collected using a disposable dual check valve bailer. If the NAPL is floating on the water surface, the bailer will be lowered to just below the water surface. If the NAPL is at the bottom of the well, the bailer will be lowered gently to the bottom of the well. After retrieving the bailer, the water will be removed from the bailer, and the remaining product will be collected into 40-mil vials with teflon-lined caps (not septa).

The vials will be filled 3/4 full and double bagged to prevent leakage. After labeling and sealing the sample container, each sample will be placed into a metal can containing one-half inch of cushioning material. The remaining volume of the can will be filled with cushioning material, and the lid will be secured with three clips. The sample number will be written on the can, and "This Side Up" and "Flammable Liquid N.O. S." labels will be placed on the can. The can(s) will be placed into a cooler(s) containing one-inch packing material. NAPL samples will be packed separately from low level samples. The remaining volume of the cooler will be filled with packing material. Paperwork and sample shipping will be handled according to the same procedures as the other samples collected at the site.

The NAPL sample will be sent exclusively to the MRD Laboratory for Fingerprint Fuel Identification using a GC-FID method ASTM D3328-78.

4.11.3 Sample Designations

Ground water samples collected from the new and existing monitoring wells and from the production wells will have the same designations as the wells. Samples from the residential wells will be designated by the well owner's name.

The depth specific ground water samples collected from the HIA wells will be designated with the well number, the sample depth, and a letter designating whether the sample was collected under static (s) or flowing (f) conditions. For example, a sample collected at a depth of 50 feet from well HIA-13 under static conditions will be designated HIA-13.50s.

4.11.4 *Sample Analyses*

All of the ground water samples from the new and existing monitoring wells will be analyzed by the off-site laboratory for TCL VOCs plus TICs, TCL SVOCs plus TICs, TAL total and dissolved metals, and cyanide (total and amenable). The ground water samples from the new shallow monitoring wells in the Industrial Area (six wells), the North Base Landfill Area (four wells), and the Runway Area (three wells), the six HIA Capture Zone shallow monitoring wells, and the 32 existing shallow monitoring wells will also be analyzed for TCL Pesticides. Samples from the three new shallow monitoring wells in the Industrial Area/Main Buildings Area, the new shallow well in the Industrial Area/Mid-Lagoon Area, and three existing shallow wells (GF-218, RFW-04, and RFW-03) will also be analyzed for TCL PCBs.

The ground water samples from the production wells and the residential wells will be analyzed for TCL VOCs plus TICs, TCL SVOCs plus TICs, TAL total metals, and cyanide (total and amenable). The eight residential well samples will also be analyzed for TCL Pesticides.

The 30 ground water samples collected during the depth specific sampling of the HIA production wells will be analyzed for TCL VOCs plus TICs, TCL SVOCs plus TICs, TCL Pesticides, TAL total metals, and cyanide (total and amenable).

4.12 *PRODUCTION WELL TESTS*

4.12.1 *Objective*

Potential migration of contamination from the former North Base Landfill is of concern for the Middletown Borough production well MID-04 and the HIA production wells. Contamination from the Industrial Area is also a concern for the HIA wells. Therefore, capture zone analyses will be performed for the production wells to determine the potential for contaminant migration in response to production well pumping. Pumping tests will be conducted to provide data for the capture zone analyses.

4.12.2 *Locations*

Pumping tests will be conducted at Middletown production well MID-04 and three HIA production wells. The three piezometer nests installed in the North Base Landfill area (Section 3.4.3) will be monitored for the MID-04 test. The eastern and western HIA production wells have been separated for the capture zone analysis. Pumping tests will be performed at two of the western HIA wells, which include HIA-6 through HIA-14. It is anticipated that well HIA-13 will be one of the wells tested. One of the eastern HIA wells, which include HIA-1 through HIA-5, will be tested. Six monitoring well nests, each consisting of a shallow, intermediate, and deep well, will be installed in the Industrial Area, as described in Section 3.9.2. These nests will be located to provide the best balance of data for the capture zone tests of the HIA wells. It is anticipated that two well nests will be monitored for each production well test.

4.12.3 *Background Information*

The Middletown production well MID-04 is at elevation 414 feet, is cased to 51 feet, and has a total depth of 815 feet. Typical pumping rates for the well during 1992 averaged 80 gpm. A turbine pump is set at 400 feet. Middletown Water Department has indicated that water level measuring equipment and a sampling port are operable. Current usage of the well is 24 hours per day.

The western HIA wells, HIA- 6 through 14, are cased to 70-200 feet, and have total depths of 450 to 800 feet. Typical pumping rates are in the range of 100 to 800 gpm. Pump information, current usage data, and more detailed information on well construction and conditions will be obtained from the Bureau of Aviation at HIA. Several of these wells are contaminated, and some are connected to air stripping towers.

The eastern HIA wells, HIA- 1 through 5, are cased to approximately 100 feet, except for well HIA-5 (data not available), and have total depths of 450 to 776 feet. Typical pumping rates range from 100 to 250 gpm. Pump information, current usage, and more detailed information on well construction and conditions will be obtained from the HIA. All wells are assumed to be non-producing, but ERM will verify the conditions. Wells 2 through 5 were reported in the RI as contaminated.

4.12.4 *Techniques*

Approximately one month prior to the beginning of the pumping tests, an antecedent background water level study will be conducted for a period of seven days in the piezometers and/or monitoring wells which will be observed during the tests. Hermit® data loggers with downhole pressure transducers will be installed in the wells to record the water level measurements at 30 minute intervals for the seven day period. Manual checks of water levels will be conducted at the beginning, middle and end of the monitoring period using an electronic water level probe to confirm the Hermit® data. Barometric conditions at the site will be monitored during the same period.

ERM will coordinate with the Middletown Water Department and the HIA Water Department prior to scheduling the pumping tests to minimize inconveniences, and reduce the potential for outside pumping influences to impact the pumping test. A 72 hour (nominal) pumping test will be conducted at each of the test wells. The water levels in the pumping well and the appropriate piezometers and/or monitoring wells will be monitored continuously during the 72 hour test. It is assumed that existing pumping systems will be used to perform the pumping tests. Manual checks of water levels will be performed periodically throughout the test. Hourly barometer readings will also be recorded in the field during the test period. Upon completion of the pumping test, water level recovery will be monitored in the pumping well and the observation wells for approximately 24 hours.

4.13 *GROUND WATER RESTORATION TIMETABLE DEVELOPMENT*

4.13.1 *Introduction*

Development of the timetable will consist of the following three components:

- development of an understanding of the relationship between contaminated soil source areas and ground water quality;

- the reconfiguration of the HIA pumping well configuration to maximize plume containment and use of existing stripping facilities; and
- ground water modeling to determine aquifer behavior and contaminant concentrations under various ground water use scenarios.

A discussion of each component is found in Sections 4.13.2 through 4.13.4.

4.13.2 *Soil Leachate Modeling*

The relationship between soil source areas and ground water quality will be determined through a soil leachate model. ERM will review the data from the previous RI and the current investigation to determine the extent and distribution of VOCs in the soil at the Site. The data will be compared with the areas of known VOC ground water contamination to determine if a correlation exists. Concentrations of contaminants in the soil will be compared to concentrations of the same contaminants in the ground water. A leachate model will be used to calculate the expected concentrations of contaminants in the ground water based upon the contaminants present in the soil.

The model will be used to determine soil cleanup levels which will then be used to evaluate the various remedial alternatives for soil remediation. A risk screening exercise will be done to determine the acceptable degree of risk in the ground water system and to back-calculate the corresponding concentration of that contaminant in the soil which does not exceed that risk.

4.13.3 *Reconfiguration of the HIA Pumping Wells*

Based upon the results of the capture zone tests at each of the HIA wells and well MID-04, ERM will evaluate various scenarios involving the use or disuse of individual or combined HIA wells to effect maximum plume containment. The reconfiguration will involve the use of basic numerical modeling to determine both flow and contaminant transport. The model will be run on a PC with the appropriate data from the investigation used in the analysis. The results of the modeling will be presented in graphical form.

Complete details of the modeling will be included in the Ground Water Modeling Work Plan discussed below.

4.13.4 *Ground Water Modeling*

ERM will review the existing data and develop a conceptual ground water flow model for the Site. Analysis of ground water flow and contaminant transport will then be evaluated using a numerical model selected based upon the conceptual model. The numerical model as well as the components in its use will be presented to the USACE in a Ground Water Modeling Work Plan.

The Ground Water Modeling Work Plan will contain the following components:

- description of the physical properties and configuration of the Site conceptual model;
- selection and description of a computer code to be used in the model;
- ERM's experience with the code and software;
- calibration of the model to the current Site conditions including a sensitivity analysis; and
- a description of the various modeling scenarios to be used.

Once completed, the Ground Water Modeling Work Plan will be submitted to USACE for review and approval prior to implementation.

4.14 *SVE PILOT TEST*

4.14.1 *SVE Recommendation*

A treatability study will be conducted to determine if SVE is a possible remedial alternative for soil remediation. Based upon the results from the Supplemental Studies Investigation, ERM will make a recommendation as to the applicability of conducting an SVE pilot test at the Site. Based on past data, the Industrial Area is a likely location for the test. ERM will review all soil, ground water and physical soil data and make an evaluation of the suitability of this area to host the SVE test.

ERM will also review the data from the entire Site to determine if an area more suitable than the Industrial Area will support a successful SVE pilot test. If either or both of these scenarios are appropriate, ERM will make a recommendation to the USACE to proceed with the test.

If the data indicate that a suitable location is not available or that a more appropriate soil remediation technology is better suited to the Site, ERM will recommend this alternative to the USACE.

The recommendation will be in the form of a summary letter outlining the data which either support or do not support a location for the SVE test or an alternate technology. Regardless of the recommendation, ERM will not proceed with the test or an alternative to the test without the permission and approval of the USACE.

4.14.2 Treatability Study Work Plan

Upon the USACE's approval of ERM's recommendation, ERM will prepare a Treatability Study Work Plan. For the purposes of this work plan, however, ERM assumes that an SVE pilot test will be conducted. The Treatability Work Plan will consist of the following components:

- definition of the test area,
- Site factors used to design the SVE system including piezometer spacing,
- installation methods for a vacuum well and three piezometers,
- equipment requirements,
- system startup and operational modes,
- sampling and analytical requirements,
- methods used in determining system effectiveness, and
- permitting, if required.

The same information discussed and reviewed below will be used to develop a treatability plan regardless of the remedial alternative recommended.

4.14.3 SVE System Operation

The system will be tested for the period specified in the Work Plan. In general, however, the system will be run in an optimum mode for a period of three to four days. A detailed discussion of the operation aspects of the system, including methods to determine system performance, will be included in the Treatbility Study Work Plan.

4.14.4 *Sampling and Analysis*

Soil samples will be collected during the installation of the SVE system for geotechnical and chemical analysis. In addition, during the operation of the system, soil gas samples will be collected from the vacuum well and piezometers for on-site screening of select VOCs and SVOCs. The details of the analytical methods as well as the analytical parameters will be discussed in greater detail in the work plan.

4.14.5 *SVE Report*

The results of the study will be presented in a summary report. This report will be included in the submission of the Operable Unit 2 Work Report discussed in Section 3.17.

4.15 *BASELINE RISK ASSESSMENT*

Baseline Risk Assessment (BRA) is a process which evaluates the collective demographic, geographic, physical, chemical and biological factors at a site to determine whether or not there may be an unacceptable risk to human health or the environment, and attempts to characterize that risk if it does exist. The objective of this BRA is to update the risk assessment conducted by the USEPA during the RI/FS. An update is required due to changed Site conditions and additional data collected during the Supplemental Studies Investigation. The assessment will be completed to reassess exposure and reasonable current and projected future uses of the Site, as well as associated risks from Site contaminants in the event that no action is taken to remove contaminants and/or prevent their migration.

The BRA will be conducted in accordance with applicable USEPA guidance, and will include the traditional four steps defined by the National Academy of Sciences (NAS, 1983) in their report, "Risk Assessment in the Federal Government: Managing the Process." These steps are as follows:

- Identification of Constituents of Potential Concern - constituents detected during the site characterization will be evaluated, and constituents of potential concern will be identified for evaluation in the BRA;
- Exposure Assessment - this task will require identification of the potentially exposed populations; determination of potential migration

and exposure pathways associated with the constituents of potential concern; and estimation of chemical intakes, using appropriate assumptions to characterize exposure;

- Toxicity Assessment - current toxicity data will be identified for each constituent of potential concern; and
- Risk Characterization - the results of the exposure assessment (i.e., the calculated intakes) will be integrated with the toxicity information to derive quantitative estimates of potential risk associated with the defined exposures. These risk estimates are compared to acceptable levels of risk defined by the USEPA.

The Human Health (HH) BRA and Environmental Evaluation (EE) will be prepared following applicable USEPA guidelines. These guidelines include: the Risk Assessment Guidance for Superfund, Volume I, Human Health (1989a); Risk Assessment Guidance for Superfund, Volume II, Environmental Evaluation Manual, Interim Final (1989b); the Exposure Factors Handbook (1989c); Superfund Exposure Assessment Manual (1988); Ecological Assessment at Hazardous Waste Sites (1989d); and Review of Ecological Risk Assessment Methods (1988). Other technical documents which support these guidelines will be used as appropriate.

The following subsections discuss the common elements of the HHBRA and EE.

4.15.1 Human Health Baseline Risk Assessment

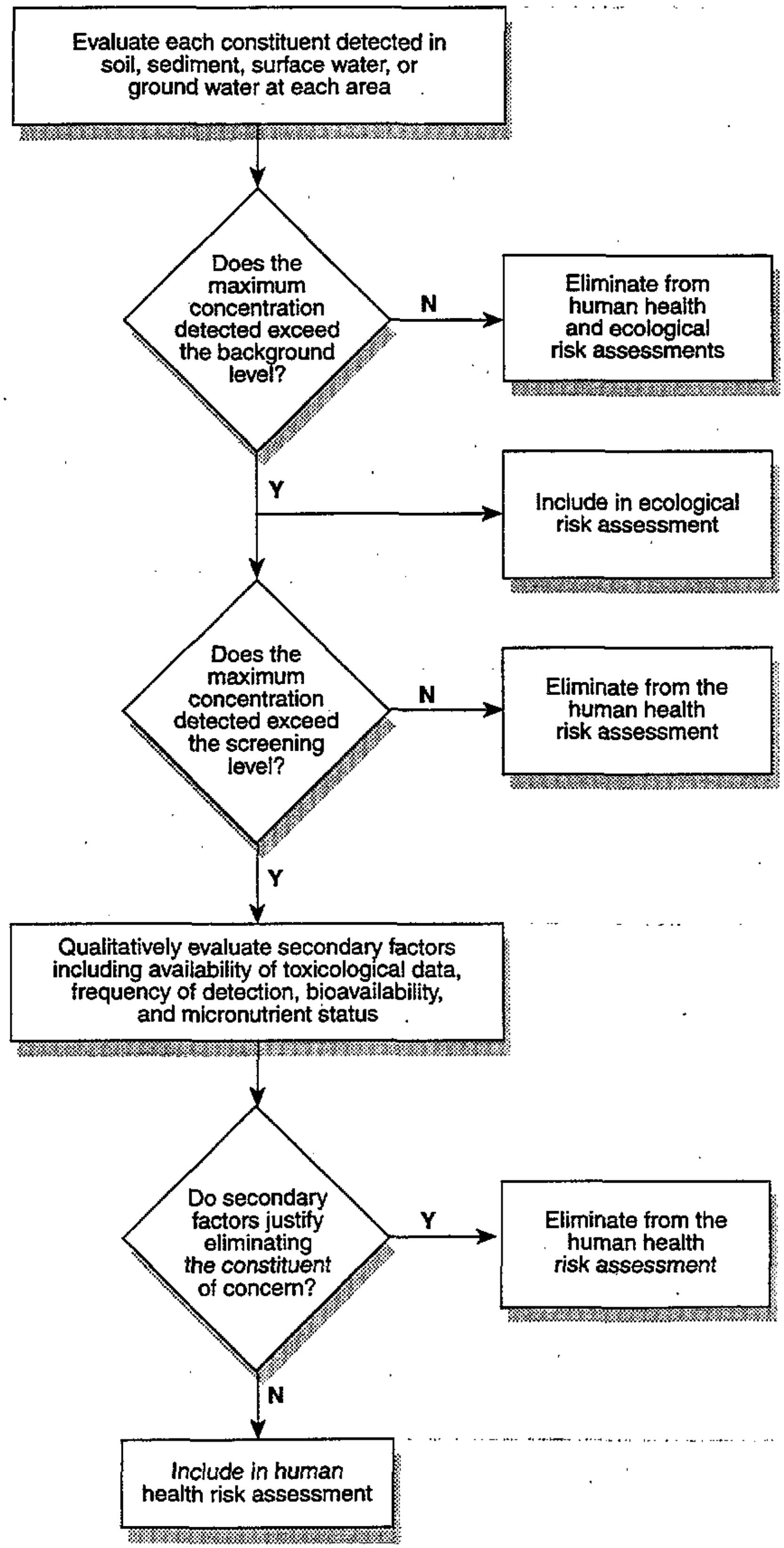
4.15.1.1 Data Evaluation

All analytical data collected during the previous investigation and additional data made available during this investigation will be reviewed for use in the HHBRA.

Chemicals of concern (COC) will be reassessed and will be selected on a site-specific basis for each medium in which chemicals are detected. Data collected during this investigation will be reviewed. COCs selected will be based on both current and previous data.

In order to select the constituents of potential concern, analytical data will be reviewed and compared to selected screening criteria. This process is outlined on Figure 4-5. For each constituent identified in each medium, media-specific screening criteria will be developed incorporating

Figure 4-5
Overall Screening Approach
Middletown Airfield



background data, promulgated regulatory criteria from both federal and state sources (potential ARARs such as Maximum Contaminant Levels or Ambient Water Quality Criteria), guidance values, and calculated health-based screening levels. The selection processes are summarized below for each media.

Soils and sediments will be screened against background levels, potential ARARs, if any exist, and calculated health-based screening levels. Background screening will only be performed for inorganic constituents because the organic constituents of potential concern on this site are generally not naturally occurring in soils.

Background screening levels will be established based on site-specific background sampling data. Because of the natural heterogeneity of soils, and the degree of variability of soil types on this site, an inorganic constituent will only be considered significant if it exceeds the background level at a concentration greater than three times the maximum observed site-specific background concentration (USEPA, 1992). Because fourteen soil units have been identified on this site and because 75% of the site has been classified as urban soil types a higher degree of heterogeneity is expected in the inorganic concentrations in soils on this site. Therefore, the maximum positively detected concentration will be employed in the estimation of background screening levels on a site-specific basis. Any inorganics exceeding background and all detected organic constituents will be compared to potential ARARs. Because there are very few promulgated standards for soils in either the federal or state regulations, calculated health-based levels will be used to screen all those constituents that do not have soil standards.

Health-based screening levels are calculated values that represent concentrations of constituents that do not pose an unacceptable risk (i.e., a carcinogenic risk of 1×10^{-6} and a hazard index of 0.1). These levels will be based on a preliminary exposure assessment to identify potential exposure pathways associated with each medium, conservative human health exposure assumptions, and current toxicity data. Calculated health-based concentrations will only be used in instances where potential ARARs are not available and will be based on the methods developed for deriving Preliminary Remediation Goals (PRGs) by USEPA in Risk Assessment Guidance for Superfund/Part B (1991). Constituents detected at concentrations lower than the human health screening levels will be eliminated from the list of constituents of potential concern for the human health risk assessment but, if they exceed background screening levels, will be retained for consideration in the ecological evaluation (Figure 4-6).

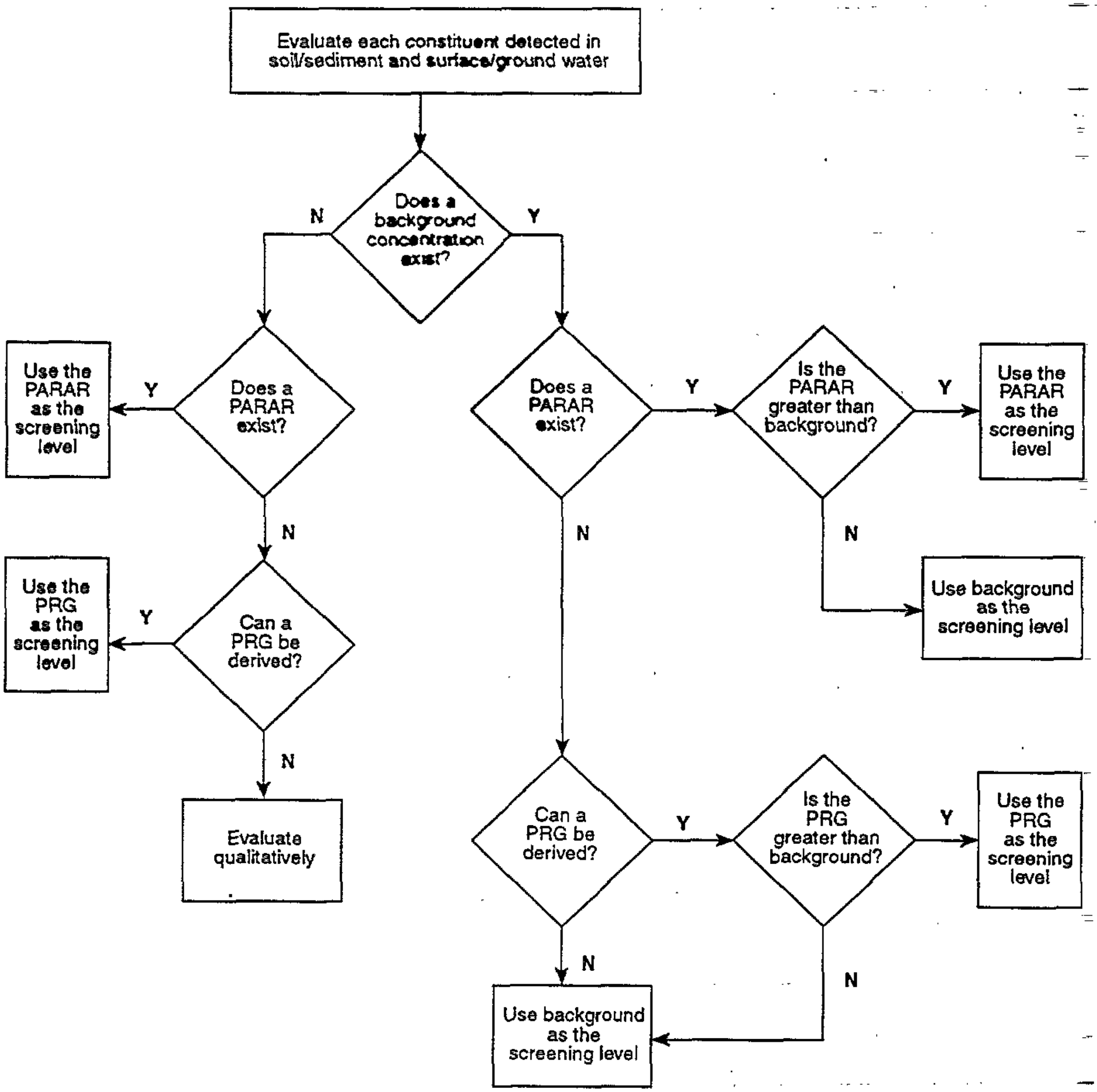
Surface water will follow a similar approach to the screening of soils; however, there are several differences due to the differences between media. Two background samples will be taken at the site; the perennial stream at Meade Heights and the Susquehanna River. The Meade Heights stream will be used as a point of comparison for surface waters in this area and samples taken from the Susquehanna will be compared to the upgradient river sample. Due to the differences in these two water bodies no attempt will be made to combine the background data; therefore, no statistical analysis will be performed on these data. Unless there is strong evidence to indicate that there is human consumption of surface water from the streams sampled and therefore that human consumption is a potential exposure pathway, only potential ARARs for the protection of ecological health will be considered. While the federal Ambient Water Quality Criteria contain an extensive list of standards for the protection of wildlife, the Pennsylvania Ambient Water Quality Standards have a more comprehensive list of standards and are generally as or more protective than the federal standards. Thus, the state and federal standards will be compared, and the more conservative chronic exposure standard will be used as a screening level. Similar to the soil approach, any constituent that does not have a potential ARAR will be compared to a health-based screening level that is calculated assuming consumption of the water.

Ground water will follow the same approach as surface water with only two differences. Background screening levels for ground water will be based on the maximum concentrations for each inorganic constituent detected in the two upgradient well nests. Ground water can be expected to be consumed, thus screening will be performed using calculated health based values that are based on residential use.

4.15.1.2 *Exposure Assessment*

This task will identify the potential exposure pathways for each medium in which chemical transport may occur, the potential receptor populations, and the applicable route of exposure. In addition, exposures will be quantified to represent the reasonable maximum exposure (RME) scenario and the average exposure (AE) scenario for both current and future land use conditions.

Figure 4-6
Screening Level Selection
Middletown Airfield
Middletown, PA



Notes:
PARAR - Potential ARAR
PRG - Preliminary Remediation Goal

4.15.1.2.1 *Exposure Pathway Analysis*

Exposure pathways to be evaluated at the Site will include both current and future use scenarios and will consist of events that may occur in systems within or adjacent to the Site. Exposure pathways to both adults and children will be examined for potential routes of exposure via ingestion, dermal contact, and inhalation of contaminated soil, sediment, surface water and ground water. Based on the conclusions of the previously conducted risk assessment, special emphasis will be placed on the exposures to ground water.

4.15.1.2.2 *Quantification of Exposure*

Based on analytical data collected from on-site locations and based on fate and transport information, exposure point concentrations will be calculated and used in determining human intake. These calculations for quantifying exposures for specific pathways will provide an estimate of exposure for on-site and off-site receptors. The 95% upper confidence limit on the mean will be used to express the exposure point concentration for each chemical. Standard assumptions recognized by USEPA will be used in the intake calculations unless site-specific characteristics are more representative of the potential for exposure. Written justification will be provided to support assumptions that represent site-specific conditions which may deviate from the standard assumptions suggested by USEPA.

4.15.1.3 *Toxicity Assessment*

A toxicity assessment will be conducted to quantitatively and qualitatively assess the potential for adverse human health effects from exposure to the COCs. The quantitative portion of the evaluation entails identifying the relevant toxicity values against which exposure point intake can be compared during the risk characterization evaluation. The qualitative aspect of the assessment will provide toxicological summaries of the adverse human health effects for each COC.

Toxicity information will be acquired from USEPA sources, such as the USEPA Integrated Risk Information Systems (IRIS) database, and Health Effects Assessment Summary Tables (HEAST).

4.15.1.4 *Risk Characterization*

The human health risk characterization will integrate information from the exposure assessment and toxicity assessment to produce both qualitative and quantitative estimates of risk. The carcinogenic and non-carcinogenic risks will be assessed to define the populations at risk from the COCs at the Site for all pertinent routes and pathways of exposure.

The risk characterization will follow standard USEPA methodology. This assumes additivity of risks from individual toxicants across all applicable exposure pathways. The risks to potentially exposed populations from exposure and subsequent intake of the COCs will be characterized by the calculation of noncarcinogenic hazard indices and cancer risks. Risks will be estimated for both the RME and AE scenarios. The cumulative risk estimates will be compared to risk levels considered to be acceptable where cumulative carcinogenic risk may range from 1×10^{-4} to 1×10^{-6}, with the point of departure at 1×10^{-6}. The cumulative noncarcinogenic risk should not exceed a Hazard Index of 1.0.

Finally, the limitations and uncertainties inherent to the HHBRA will be discussed on an area specific basis to provide the proper perspective for the characterization results.

4.15.2 *Environmental Evaluation*

The Environmental Evaluation (EE) will be conducted concurrently with the HHBRA and generally will follow the same steps as the HHBRA. However, it should be noted that environmental evaluations are typically conducted using qualitative methods and may not provide a definitive answer regarding potential risks because quantitative methods require extensive data collection and are of long duration. Such evaluations may provide information regarding the likelihood of adverse effects on the ecological community.

The environmental evaluation will consist of two primary interrelated tasks, the Baseline Ecological Characterization and the Ecological Effects Characterization. These tasks and related subtasks are described in the following subsections.

4.15.2.1 *Baseline Ecological Characterization*

The baseline ecological characterization will involve the review of previously conducted site assessments, analytical results from the current investigation, and a site visit to survey and evaluate the current site conditions. This review will serve as a synopsis of the prevailing ecology to provide an overview of the pertinent systems, as well as identify potential sensitive habitats, receptor populations and/or threatened or endangered species.

The site visit will be conducted to obtain the current site ecological status, to develop a preliminary conceptual model of existing conditions, and to develop an accurate habitat covertype map at the Site. Survey observations will include: habitat covertypes, threatened and endangered species, and potential receptors.

4.15.2.1.1 *Habitat Covertypes*

The site investigation will include mapping of different habitats found within the Site, including the identification of predominant covertypes and habitats. Land use will also be delineated. Site-related areas of concern will be plotted on this map, as will signs or patterns of stressed or dead vegetation within a habitat . During the site investigation, detailed notes of wildlife species inhabiting each covertype will be developed.

Text and tables will be developed for each area identified on the habitat covertype map to describe unique features, common species within the vegetative community, areal coverages of each community and land use. The habitat covertype assessment will aid in the identification of site-specific potential receptors based on habitat preferences, and serve to characterize predicted affects to potential pathways and overall ecosystem health.

4.15.2.1.2 *Threatened and Endangered Species*

In an effort to confirm that there are no threatened or endangered (T&E) species that are indigenous to this Site, a T&E search of state and federal natural resource data bases will be performed. Data will be verified during a site-survey by ERM biologists. This will provide the most current information regarding these species. In addition, information from previous studies will be used to identify potential T&E species which might occur on the Site. Special consideration will be given to habitat preferences of these species during the site investigation.

4.15.2.1.3 *Receptor Identification*

During the site investigation, detailed notes of wildlife species inhabiting the Site will be developed. Identification of animal species inhabiting an area will be accomplished through direct observation of animal signs such as tracks, calls, nesting structures, and scat. Regional taxa lists for plants, mammals, birds, amphibians and reptiles, and fish that are known to inhabit the area will be obtained through Pennsylvania state and federal natural resources agencies. Lists of such species already compiled and available in the 1990 GF Report and ERM's biological survey will be used to the extent possible to minimize duplication of efforts. The list of species developed from these sources, together with information on habitat and species composition observed during the site investigation will also be used to identify potential receptors based on this information. From the potential ecological receptors identified, indicator species that are most likely to be affected by COCs and ecological endpoints will be selected.

4.15.2.2 *Ecological Effects Characterization*

This portion of the environmental evaluation will be conducted in a manner similar to the four NAS steps presented in the HHBRA.

4.15.2.2.1 *Identification of Potential Constituents of Concern*

Potential COCs will be selected based on the screening evaluation outlined in the HHBRA, allowing for any unique ecological concerns (such as sensitive species). All constituents that are found at concentrations greater than the site-specific background levels will be carried forward as COCs. Data from previous investigations and the current investigation will be considered in the selection of COCs. These constituents will be evaluated using the procedures outlined in Sections 4.15.2.2.2 through 4.15.2.2.5 for the ecological effects characterization.

4.15.2.2.2 *Exposure Assessment*

Potential exposure of receptor populations to COCs will be evaluated for frequency and duration. Exposure scenarios will be developed based on the results of the Baseline Ecological Characterization and the mobility, persistence, bioavailability, bioaccumulation and biomagnification properties of the COCs. Evaluation of information from the fate and transport of the COCs will be used in conjunction with site-specific analytical data to estimate exposure point concentrations. Exposure point concentrations may include basic food chain modeling if COCs include bioaccumulating or biomagnifying constituents.

4.15.2.2.3 Toxicity Assessment

An ecotoxicity assessment will be conducted to qualitatively and quantitatively evaluate the potential for adverse effects from the possible exposure to COCs. The qualitative aspect of the assessment summarizes pertinent ecotoxicity data for the COCs. The quantitative data will focus on population endpoints that have been measured using single-species toxicity testing. These endpoints include both acute measures of lethality and chronic evaluations of developmental, reproductive and behavioral effects that may occur in species that may inhabit the Site. These studies, generally based on studies conducted on mice and rats, will be used as surrogate species for a similar terrestrial mammalian species that may be present on the Site, with the application of an appropriate interspecies correction factor.

4.15.2.2.4 Risk Characterization

Risk characterization will integrate information from the preceding steps to produce both qualitative and quantitative interpretation of ecological impacts at the Site. The risks to potentially exposed receptor populations that inhabit and/or use the affected ecosystems will be presented in a quantitative manner where quantitative indices are available. A qualitative discussion will also be presented regarding the possibility for adverse effects.

Quantitative techniques to be used will involve the comparison of the predicted and/or measured exposure point concentrations of the COCs with the appropriate chemical-specific indices of toxicity to estimate the possibility of adverse effects. Qualitative methods of characterization may not provide a definitive answer regarding potential risks, but they may yield important insight necessary for further evaluation and provide the basis for professional judgment concerning the likelihood of adverse effects. Qualitative assessment of potential ecological risk will draw on pertinent literature and experience to interpret and augment the results of the quantitative analysis.

4.15.2.2.5 *Uncertainty Analysis*

The uncertainty analysis identifies and, to the extent possible, quantifies the uncertain assumptions and evaluations made throughout the risk assessment. The uncertainty analysis will describe how the uncertainty could affect the overall risk characterization and make recommendations, if needed, to reduce the uncertainty. This section will be provided in association with each area evaluated in the risk assessment.

4.16 *QUARTERLY MONITORING*

4.16.1 *Locations*

Quarterly ground water monitoring will be conducted at the four sentinel wells (two shallow and two intermediate) in the North Base Landfill area to monitor the potential migration of contaminants to the Middletown Borough production well MID-04. Quarterly surface water and sediment sampling will be conducted at the same four locations in the Susquehanna River that will be sampled during the initial surface water and sediment sampling event described in Sections 3.6.1 and 4.8.2. If the stakes marking sample locations are still present, their locations will be verified before sampling. If the stakes cannot be located, the sampling stations will be located based on measured positions recorded during the initial sampling.

4.16.2 *Techniques*

The quarterly sampling will be conducted through the third quarter of 1995 for a total of seven quarters. The ground water sampling will be conducted following the procedures described in Section 4.11.2. Water levels will be measured prior to purging, and a minimum of three well volumes will be purged prior to sample collection. If dedicated PVC bailers are used for the initial ground water sampling, the bailers will be stored on-site in plastic bags labeled with the well numbers. The bailers will be allowed to air dry before they are placed into plastic bags, and they will be stored in the field operations trailer. The same bailers will be used for each quarterly sampling event of the sentinel wells. The bailers will be rinsed thoroughly with distilled water prior to each use.

The Susquehanna River surface water and sediment samples will be collected following the procedures described in Section 4.8.2.

4.16.3 *Sample Designations*

The quarterly ground water samples will be designated with the corresponding sentinel well number. The quarterly Susquehanna River samples will be designated by the same sample location numbers used during the initial sampling event.

4.16.4 *Sample Analyses*

The ground water samples from the sentinel wells will be analyzed for TCL VOCs plus TICs, TCL SVOCs plus TICs, TAL total and dissolved metals, and cyanide (total and amenable). The samples from the two shallow wells will also be analyzed for TCL pesticides. Field parameters including temperature, pH, specific conductance, and turbidity will be measured at the time of sample collection.

The surface water and sediment samples will be analyzed for TCL VOCs plus TICs, TCL SVOCs plus TICs, TCL pesticides/PCBs, TAL total metals, and cyanide (total and amenable). The surface water samples will also be analyzed for water quality parameters including hardness, alkalinity, and total dissolved solids. Field parameters including temperature, pH, specific conductance, and dissolved oxygen will be measured in-situ at the sampling location. Sediment samples will also be analyzed for TOC, moisture content, pH, CEC, and grain size. Measurements of pH will also be taken in the field by mixing four parts distilled water to one part sediment.

4.17 *DECONTAMINATION PROCEDURES*

All non-disposable equipment used for the collection, preparation, preservation, and storage of environmental samples must be decontaminated prior to use and after each subsequent use to prevent cross-contamination between sampling locations. Decontamination of equipment will take place at a specific decontamination area designated at the Site, with the exception of sampling equipment such as split spoons or Geoprobe samplers which will be decontaminated at the drilling location. The decontamination area will be away from sources of contamination such as exhaust fumes and dust. Decontamination water will be collected in the decontamination area and and handled according to procedures described in Section 4.19.

4.17.1 *Drilling Equipment Decontamination*

Geoprobe and drilling equipment will be decontaminated prior to initial use, between boring locations, and at the completion of drilling activities. Items which will be decontaminated will include all downhole equipment which comes into contact with potentially contaminated material (probing tools, augers, air hammers and drilling rods) and the back of the drilling rig.

The equipment will be decontaminated by manual scrubbing, if necessary to remove foreign material, followed by thorough steam cleaning. Equipment which will not be used immediately will be stored in a contaminant-free location, above ground on wooden supports.

4.17.2 *Sampling Equipment Decontamination*

All non-disposable equipment (hand augers, split spoon samplers, stainless steel bowls, spoons, and trowels, hand augers, etc.) will be decontaminated as follows:

- Manual scrub with laboratory grade, non-phosphate soap and tap water, using a brush if necessary to remove particulate matter and surface films,
- Thorough rinse with approved potable water,
- Rinse with 10% nitric acid (only for samples collected for metals analysis),
- Tap water rinse,
- Pesticide grade methanol rinse (only for samples collected for organics analysis),
- Triple rinse with distilled/deionized water,
- Air dry.

At a minimum, decontamination water used to clean split spoon samplers will be changed between each boring.

Equipment which will be stored for future use or will be transported to a sampling location will be wrapped completely with aluminum foil to prevent contamination.

The pumps used for developing and purging the wells will be decontaminated between each use. Submersible pumps will be placed in a container of clean tap water, and four to five gallons of water will be run through the pump and discharge hoses. The clean water rinse will then be repeated using a second container filled with distilled water.

PVC bailers used for sampling and/or purging monitoring wells will be dedicated to individual monitoring wells. After each use, the bailer will be rinsed with distilled water, placed in a plastic bag that is clearly labeled with the monitoring well number, and stored for future use in an appropriate location on the Site.

4.18 SAMPLE HANDLING AND PRESERVATION

Samples will be placed into properly labeled sample containers with the necessary preservatives already added by the laboratory. Tables 4-1, 4-2, and 4-3 of the QAPP list the proper container material, volume requirement, and preservation needed for the various sampling media. Custody of the sample bottles will be maintained by the FOM. Sample bottles needed for a specific sampling task will be relinquished by the FOM to the sampling team after the FOM has verified the integrity of the bottles and ensured that the proper bottles have been assigned to the task to be conducted.

Ground water samples that are collected for dissolved metals analysis will be field filtered prior to preservation using a Millipore® Hazardous Waste Filtration System. The Millipore® is a pressure filtration system which allows for rapid filtration and is constructed of stainless steel and Teflon® materials which can be decontaminated between uses. An inert nitrogen (N_2) gas supply is used as the pressure source. The sample will be poured from the bailer into the Millipore® system and a 0.45-micron pore-sized membrane will be used to remove suspended sediment from the sample. The sample will be filtered directly into the appropriate sample container, with the necessary preservatives already added.

Immediately after sample collection, each sample bottle will be sealed in an individual plastic bag and placed into an insulated cooler for shipment to the laboratory. Sample coolers will be packed with double bagged conventional ice to maintain a temperature of 4°C until the sample is received by the laboratory. Samples will be packed in a manner to prevent damage to sample containers during shipment to the laboratory.

Section 5.0 of the QAPP provides detailed information regarding proper sample labeling and chain-of-custody documentation. ERM field Chain-of-Custody records and ERM Traffic Report forms will be completed at the time of sample collection and will accompany the samples inside the coolers for shipment to the laboratory. These record forms will be sealed in a ziploc plastic bag to protect them against moisture. The bag will be taped to the underside of the cooler lid. An additional form, entitled "Characterization of Environmental Samples for Disposal", will also be included in shipments to the MRD Laboratory. In addition, shipments to MRD Laboratory will be assigned project specific LIMS numbers, which will be written on the chain-of-custody and Traffic Report forms. Each sample cooler will be sealed with a signed ERM custody seal, and the coolers will be shipped by an overnight courier according to current US DOT regulations. Additional details concerning sample handling are described in Section 5.0 of the QAPP.

The ERM Field Operations Manager and Laboratory Coordinator will communicate regularly during the field investigation concerning the sampling schedule and sample shipment and delivery to the laboratory. The ERM Laboratory Coordinator will provide regular updates to the analytical laboratory, including notifications of initial, weekend, and final sample deliveries for each sample delivery group. The MRD Laboratory will be notified one week prior to the first delivery of samples, and at least 24 hours notice will be given for Saturday sample delivery. A notation will be made on the Chain-of-Custody form to the MRD Laboratory when the final shipment of samples is sent at the completion of field sampling activities for each stage of the investigation.

4.19 DISPOSITION OF INVESTIGATION-DERIVED WASTE

Investigation-derived wastes (IDW) will include soil cuttings from soil borings and monitoring well installation, decontamination fluids, well development water, well purge water, and miscellaneous personal protective equipment (gloves, etc.) These IDW will be handled as described below.

4.19.1 Soil Cuttings from Soil Borings and Monitoring Wells

Soil cuttings generated from monitoring well installation and soil borings at the Site will be placed in roll-offs for subsequent testing and analysis.

Based on analysis results, the soils will be transported off-site for disposal in either a municipal or hazardous waste facility.

A decision will be made regarding the disposition of soil cuttings from the background soil borings after the boring locations have been selected and approved by USACE and USEPA. Alternatives which will be considered for disposition of background soil cuttings will include backfilling borings, spreading cuttings on the ground, or containing soils in drums or roll-offs for characterization and appropriate disposal.

4.19.2 *Monitoring Well Development and Purge Water*

All monitoring well development and purge water will be contained in a portable 4,000-gallon tank for staging in a stationary Baker Tank for subsequent testing and disposal. It is anticipated that water encountered during drilling activities will be sent to the local POTW. The possibility of discharging this water to the on-site lagoons will also be investigated. Pumping test water is anticipated to go to the HIA air stripper for the HIA well tests and into the Middletown water system for the MID-04 well pumping test.

4.19.3 *Decontamination Fluids*

Decontamination fluids will include water, 10% nitric acid and pesticide-grade methanol. Decontamination water and nitric acid rinsate will be placed in 55-gallon drums for subsequent testing and disposal. Methanol rinsate will be contained and segregated from other decontamination fluids and will be stored on-site pending proper disposal as IDW.

4.19.4 *Personal Protective Equipment*

Personal Protective Equipment (PPE) that is non-disposable will be cleaned. Disposable PPE (such as latex gloves, Tyvek suits, etc.) will be placed in 55-gallon drums for subsequent disposal.

4.19.5 *Handling of Drummed Waste*

All drums used to store IDW will be numbered and labeled. The following information will be included on the drum labels:

- The generator name;

- Material in the drum (i.e., soil from boring IAP-SB1, purge water from wells ERM-1S and ERM-1I, decontamination water, etc.); and
- The date on which the material was placed in the drum; if material is accumulated in a drum over several days, the last date on which material was placed in the drum will be used.

Information will be recorded on drum labels using legible handwriting and indelible ink that will be legible for a long duration. Upon completion of the project, a Drum Inventory sheet (Figure 4-7) will be filled out.

Drums will be temporarily stored in a predesignated storage area on the Site, and the drums will be covered with plastic until a disposal option is decided upon. Once all drummed materials have been generated, material in the drums may be sampled and submitted for laboratory analyses. Samples of drummed material will be analyzed for the same analytes as the associated environmental samples collected from the area in which the waste was generated. Additional analytes may be required for off-site disposal.

Once analytical results are received, the fate of the drummed material will be decided. The preferred method of disposal will be to spread the drummed material on the ground surface in the area from which the material originated. However, if analytical results indicate that this method of disposal is inappropriate, arrangements will be made to properly dispose of the material at an off-site location.

Depending on the disposal facility, additional analyses (most likely consisting of TCLP, corrosivity, ignitability, and reactivity) may be required prior to acceptance of the waste by the disposal facility. Additional analytical data will be obtained only if the disposal facility requires the additional data.

Figure 4-7
Drum Inventory Form
Middletown Airfield Site

Site Name: ______________________ Project Number: ______________________

Site Location: ______________________ Project Manager: ______________________

Drum Number	Drum Size (Gallons)	Drum Amount (% Full)	Contents (Soil/Development Water/Purge Water, etc.)	Source Location (Well #/Boring #, etc.)	Date Filled	Comments
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						

Section 5

Section 5

5.0 PROJECT STAFFING AND SCHEDULE

5.1 PROJECT STAFFING

The ERM project team consists of experienced professional geologists, engineers and scientists capable of successfully completing the implementation of the Supplemental Studies Investigation for the Site. Figure 5-1 illustrates the key technical personnel who will be involved in the project coordination and implementation.

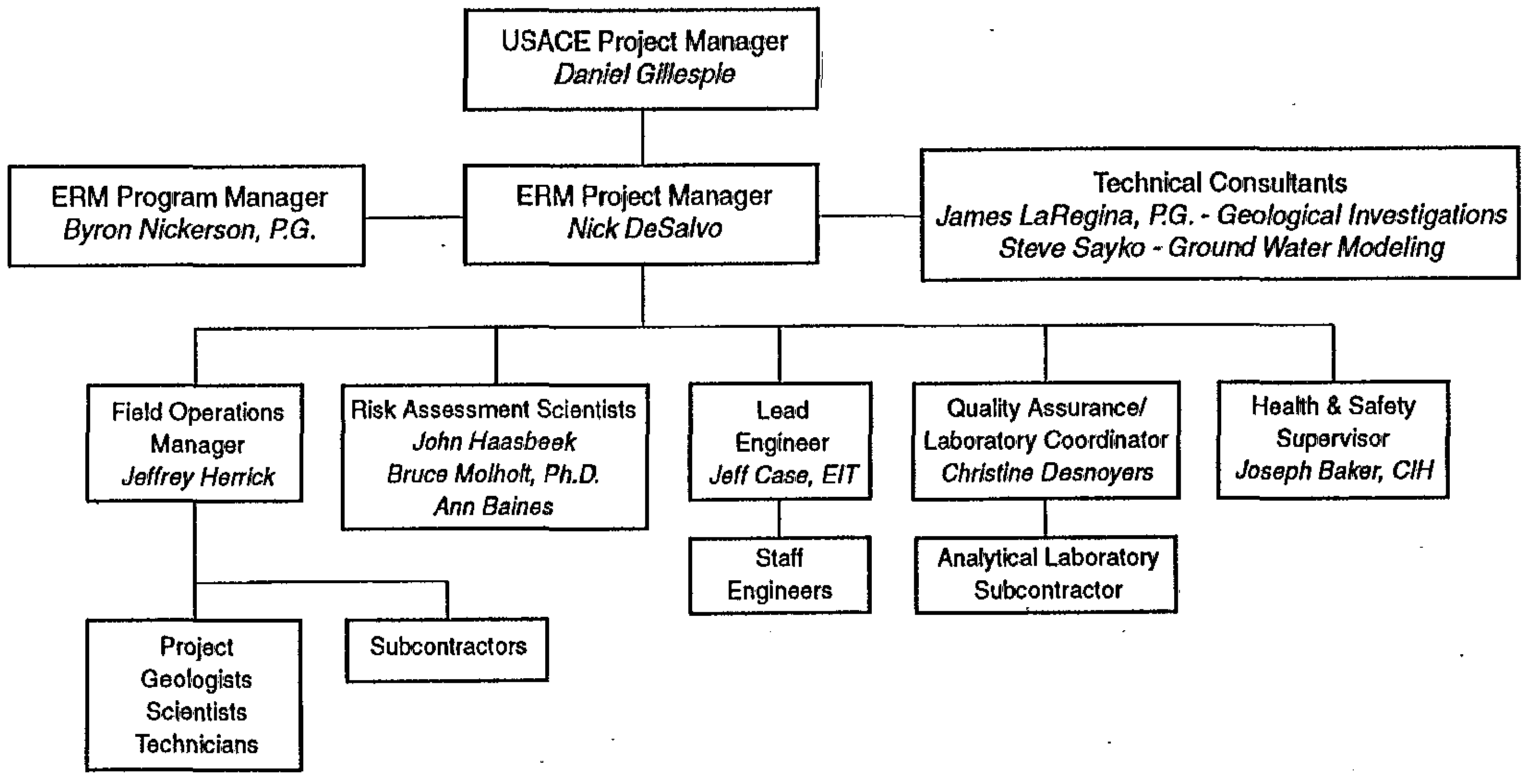
The Program Manager for this project will be Mr. Byron Nickerson, P.G. Mr. Nickerson is a professional geologist with 12 years of experience as an environmental consultant. As Program Manager, he will assure that the Project Manager has assigned adequate resources to execute the project and will perform technical reviews on selected deliverables throughout the project.

Mr. Nick DeSalvo, CPSS will serve as the Project Manager for the investigation. Mr. DeSalvo is a certified professional soil scientist with 11 years of experience in the planning and implementation of hydrogeological site investigations. In the role of Project Manager, he will maintain contact with the Field Operations Manager to track the progress of the investigation and will ensure that the project deliverables are completed on schedule. He will directly oversee the remainder of the ERM project team and the subcontractors.

Mr. Jeffrey Herrick will be the Field Operations Manager for the Site. Mr. Herrick has 5 years of experience in the field of environmental consulting. As the Field Operations Manager, he will be responsible for the day-to-day activities of the ERM field personnel and the subcontractors. He will review the available site data, oversee the field field activities, and be responsible for field quality assurance. He will communicate with the Project Manager to ensure that the investigation is completed on schedule and in accordance with the Work Plan.

Mr. John Haasbeek will be the lead Risk Assessment Scientist for this project. Mr. Haasbeek has managed and performed risk assessments and cleanup level calculations at a number of sites under federal and state programs. For this project, Mr. Haasbeek will ensure that sufficient data

Figure 5-1
Project Team
Supplemental Studies Investigation
Middletown Airfield Site
Middletown, PA



are collected to adequately determine the significance of the risks posed by the Site, coordinate and assist in preparation of the risk assessment, perform the fate and transport evaluation, and assist with agency discussions, as necessary, regarding the potential site risks.

Dr. Bruce Molholt and Ms. Ann Baines will assist Mr. Haasbeek with the risk assessment. Dr. Molholt will primarily be responsible for senior review of the risk assessment report and will directly assist with the human health and toxicologic sections of the risk assessment. Ms. Baines will assist in the human health and ecological evaluations.

The Quality Assurance Coordinator for the project will be Ms. Christine Desnoyers. Ms. Desnoyers will coordinate communication between the project team and the subcontracted analytical laboratory and will supervise the data validation process for the analytical data collected during the investigation.

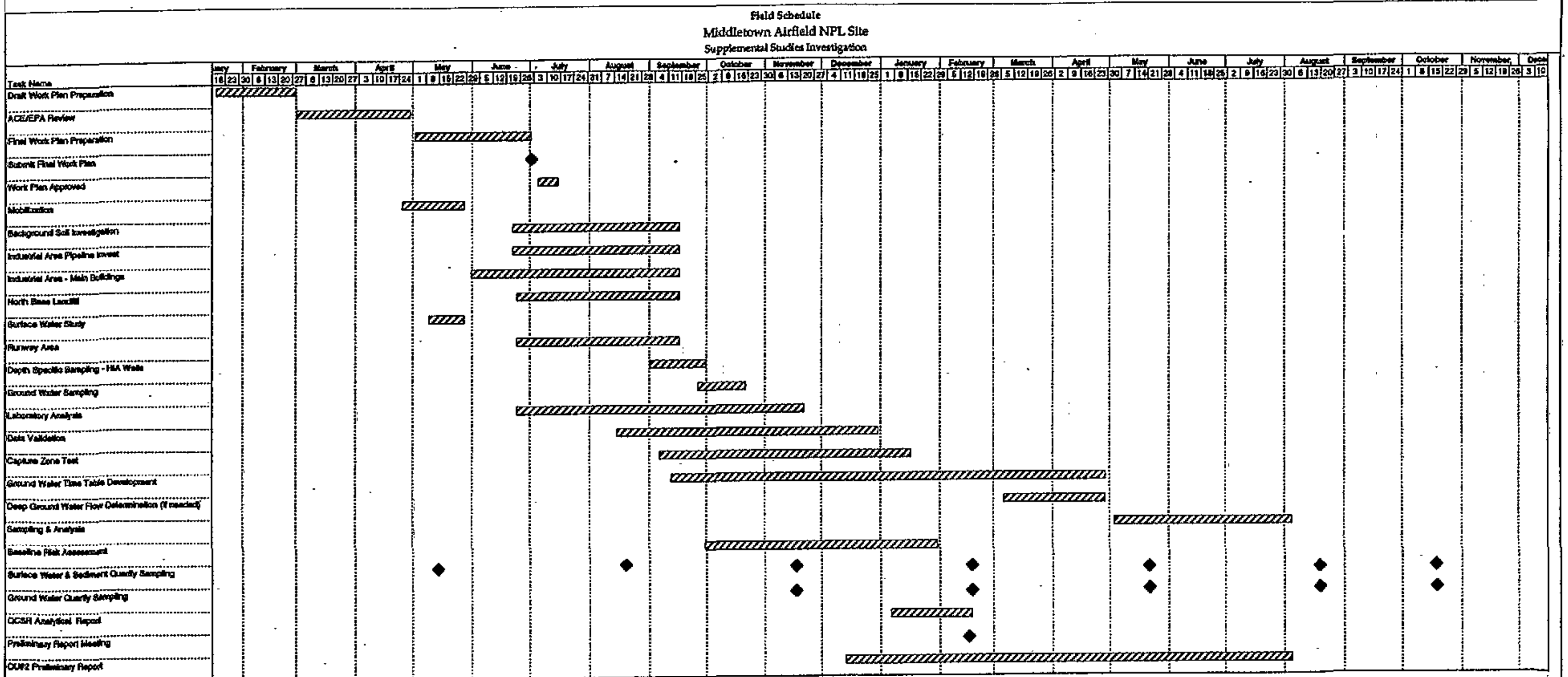
Mr. Joe Baker, CIH, will be the Project Safety Supervisor for the project. Mr. Baker will ensure that the investigation is performed in accordance with the Site Safety and Health Plan. He will approve all safety procedures and operations at the Site and will update equipment and procedures based on new information gathered during the investigation.

The ERM project team will also include project engineers, geologists, scientists, and technicians who will perform various field activities during the investigation. Senior technical personnel will provide assistance with project planning and data interpretation and will review technical reports throughout the investigation. ERM will use qualified subcontractors to perform certain investigation activities, including soil borings, drilling and monitoring well installation, borehole logging, and analytical laboratory services.

5.2 *PROJECT SCHEDULE*

The project schedule for the Supplemental Studies Investigation is presented in Figure 5-2. This figure illustrates the anticipated schedules for individual tasks and deliverables. Submission of the Draft Operable Unit 2 Report is currently scheduled for 4 August 1995, assuming no tasks are added to the investigation or delays occur due to difficulties in obtaining access agreements. Figure 5-3 present a detailed schedule of the field work planned for the Supplemental Studies Investigation.

FIGURE 5-2
PROJECT SCHEDULE
MIDDLETOWN AIRFIELD SITE
SUPPLEMENTAL STUDIES INVESTIGATION



Prepared for:
U.S. Army Corps of Engineers
Omaha District

Source: ERM 1 July 1994 (Revision #1)

AR302930

FIGURE 5-3
PROJECT SCHEDULE
MIDDLETOWN AIRFIELD SITE
SUPPLEMENTAL STUDIES INVESTIGATION

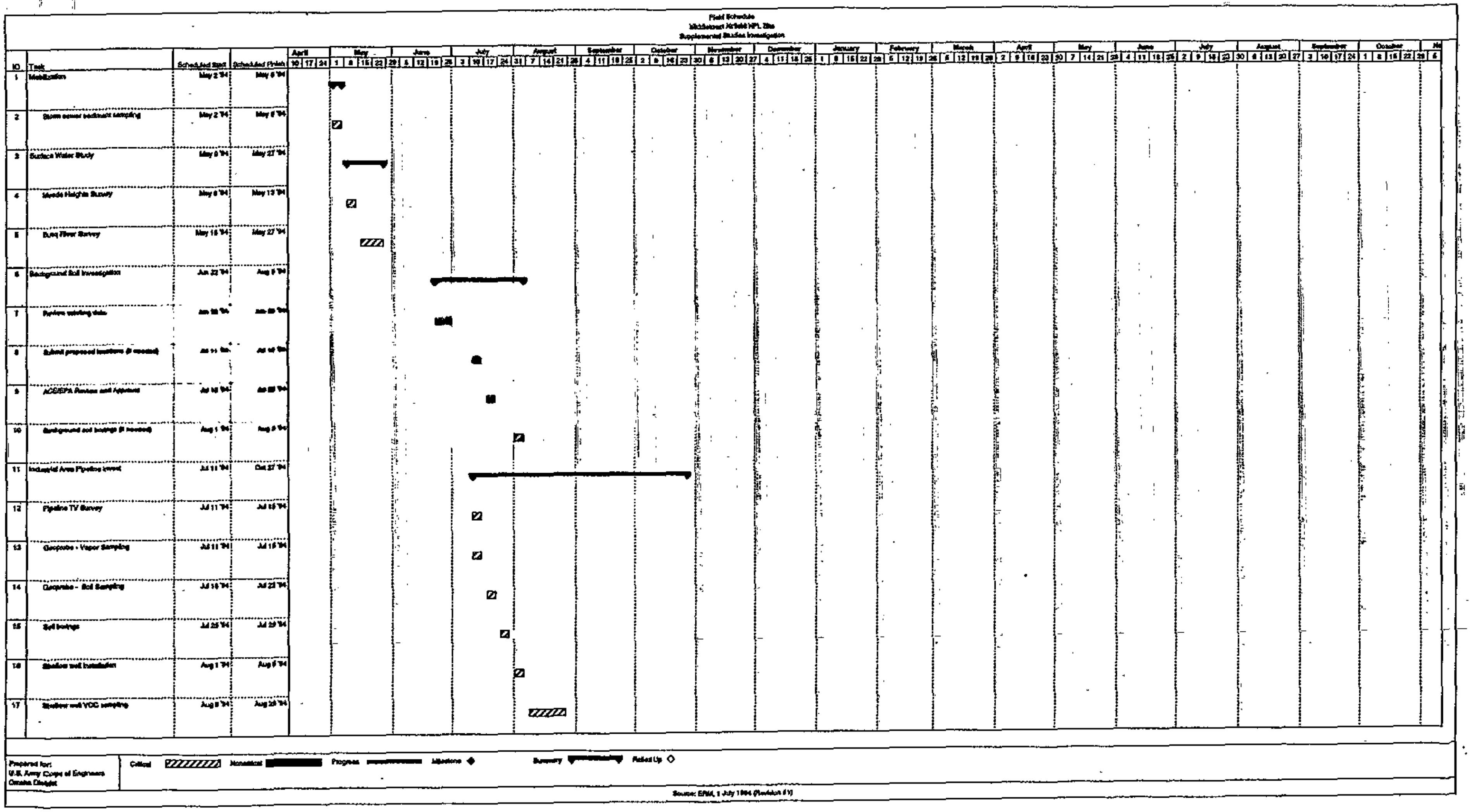


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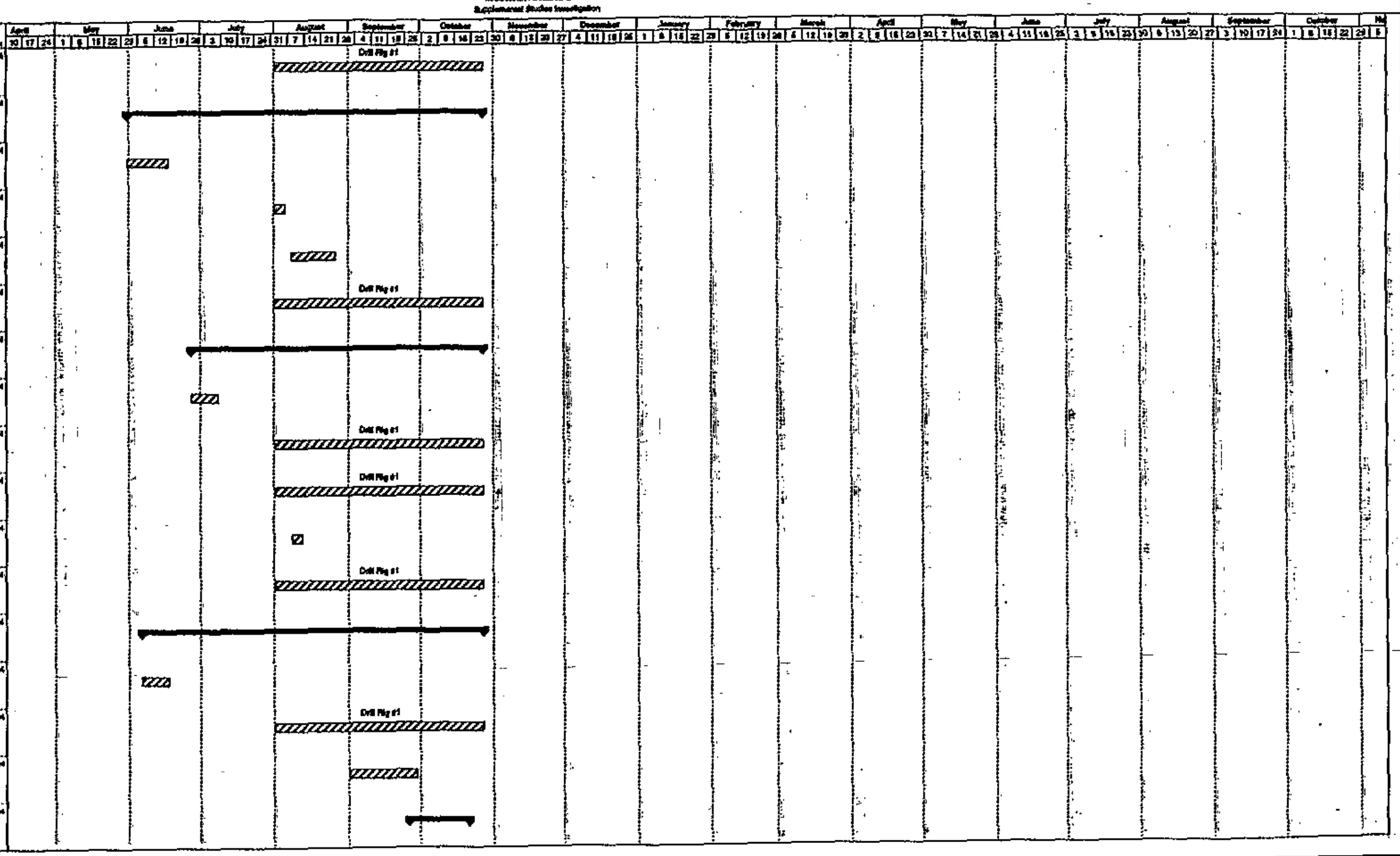
FIGURE 5-3 (Continued)
PROJECT SCHEDULE
MIDDLETOWN AIRFIELD SITE
SUPPLEMENTAL STUDIES INVESTIGATION

Field Schedule
Middletown Airfield HPL Site
Supplemental Studies Investigation

ID	Task	Scheduled Start	Scheduled Finish
18	Medium well installation	Aug 1 '94	Oct 27 '94
19	Industrial Area - Main Buildings	May 31 '94	Oct 27 '94
20	Soil borings	May 31 '94	Jun 17 '94
21	Shallow well installation	Aug 1 '94	Aug 5 '94
22	Shallow well VOC sampling	Aug 8 '94	Aug 26 '94
23	Medium/Deep well installation	Aug 1 '94	Oct 27 '94
24	North Base Landfill	Jun 27 '94	Oct 27 '94
25	Geoprobe - ground water sampling	Jun 27 '94	Jul 8 '94
26	Sentinel well installation	Aug 1 '94	Oct 27 '94
27	Piezometer installation	Aug 1 '94	Oct 27 '94
28	Shallow well installation	Aug 8 '94	Aug 12 '94
29	Medium well installation	Aug 1 '94	Oct 27 '94
30	Runway Area	Jun 6 '94	Oct 27 '94
31	Shallow well installation	Jun 6 '94	Jun 17 '94
32	Medium well installation	Aug 1 '94	Oct 27 '94
33	Depth Specific Sampling - HIA Wells	Sep 1 '94	Sep 29 '94
34	Ground Water Sampling	Sep 26 '94	Oct 21 '94



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U.S. Army Corps of Engineers
Omaha District

Critical — Noncritical — Progress — Milestone ◆ — Summary — Rolled Up ◇

Source: ERM, 1 July 1994 (Revision #1)

AR302932

FIGURE 5-3 (Continued)
PROJECT SCHEDULE
MIDDLETOWN AIRFIELD SITE
SUPPLEMENTAL STUDIES INVESTIGATION

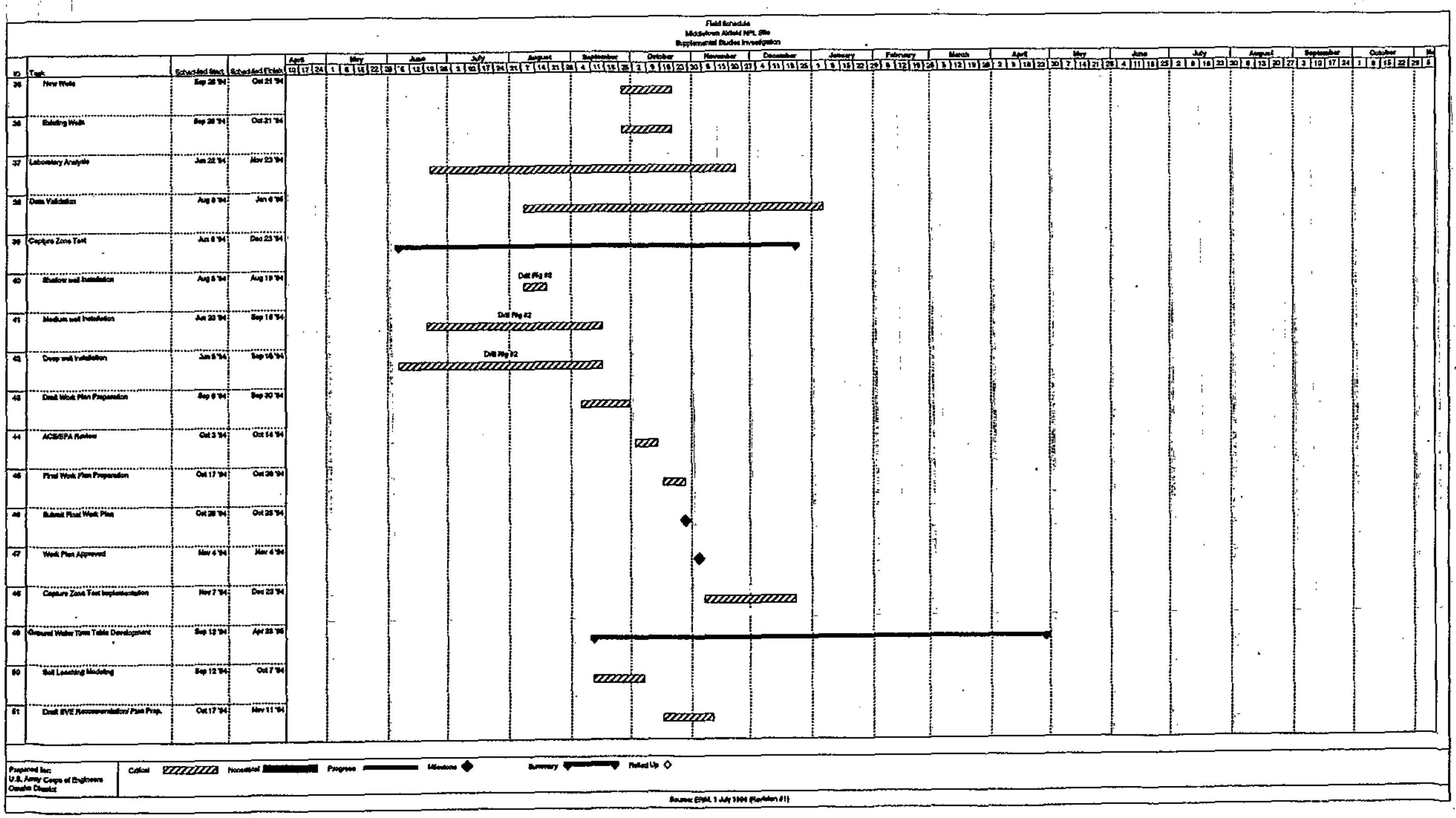
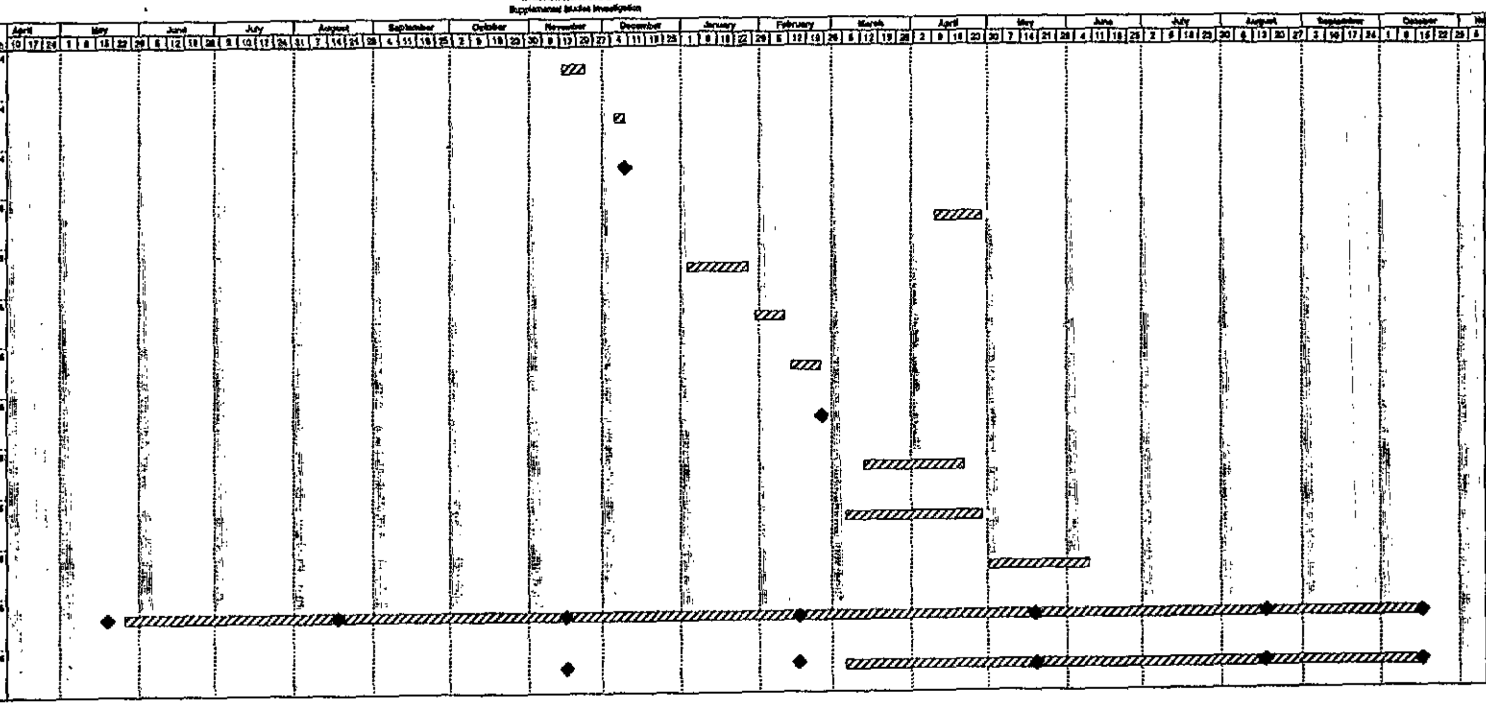


FIGURE 5-3 (Continued)
PROJECT SCHEDULE
MIDDLETOWN AIRFIELD SITE
SUPPLEMENTAL STUDIES INVESTIGATION

Field Schedule
Middletown Airfield NPL Site
Supplemental Studies Investigation

ID	Task	Scheduled Start	Scheduled Finish
52	ACE/EPA Review	Nov 14 '94	Nov 23 '94
53	Final Work Plan Preparation	Dec 5 '94	Dec 9 '94
54	Submit Final Work Plan	Dec 9 '94	Dec 9 '94
55	SVE Pilot Implementation/Anal.	Apr 10 '95	Apr 28 '95
56	Draft Ground Water Modeling Plan Prep.	Jan 2 '95	Jan 27 '95
57	ACE/EPA Review	Jan 30 '95	Feb 10 '95
58	Final Ground Water Modeling Plan	Feb 13 '95	Feb 24 '95
59	Submit Final Work Plan	Feb 24 '95	Feb 24 '95
60	GW Model Implementation	Mar 13 '95	Apr 21 '95
61	Deep Ground Water Flow Determination (if Needed)	Mar 6 '95	Apr 28 '95
62	Sample & Analysis	May 1 '95	Jun 9 '95
63	Surface Water & Sediment Quality Sampling	May 26 '94	Oct 18 '95
64	Ground Water Quality Sampling	Mar 6 '95	Oct 18 '95



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Omaha District

Critical Noncritical Progress Milestone ◆ Summary Rolled Up ◇

Source: EPM, 1 July 1994 (Revision #1)

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